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| 10/763,812   | 01/23/2004  | C.P. Kelkar          | 4959                | 5008             |
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| BASF CATALYSTS LLC<br>100 CAMPUS DRIVE<br>FLORHAM PARK, NJ 07932 |             |                      |                     |                  |
| EXAMINER   |             |                      |                     |                  |
| SINGH, PREM C  |             |                      |                     |                  |
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| 1797   |             |                      |                     |                  |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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### Office Action Summary

**Application No.**

10/763,812

**Applicant(s)**

KELKAR ET AL.

**Examiner**

PREM C. SINGH

**Art Unit**

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 17-23 and 25-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-23, 25-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Response to Amendment*

1. Amendment to claims 17 and 25 is noted.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 17-23, and 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peters et al (US Patent 6,379,536) in view of Aubert et al (US Patent 6,214,306).

6. With respect to claim 17, Peters discloses a process for NO<sub>x</sub> control in an FCC process by using a composition that comprises (i) an acidic oxide support, (ii) an alkali/alkaline earth metal, (iii) a transition metal oxide having oxygen storage capability, and (iv) a transition metal selected from Group I B and/or II B. (See column 1, lines 53-62). Peters further discloses a method of reducing NO<sub>x</sub> emission during fluid cracking of a hydrocarbon feedstock into lower molecular weight components, said method comprising contacting a hydrocarbon feedstock with a cracking catalyst at elevated temperature whereby lower molecular weight hydrocarbon components are formed, said cracking catalyst comprising a NO<sub>x</sub> reduction component of the invention (See claim 12, column 6, lines 22-40).

Peters invention does not specifically disclose the ratio between the mixed metal (cerium and zirconium) oxides and the remaining components of the NO<sub>x</sub> reduction composition. However, the invention does disclose in an embodiment ceria content of 1

wt% based on the silica-alumina support and silver oxide to be 5 wt % of the silica-alumina support (See column 4, lines 34-48).

Peters does not disclose (i) mixed cerium and zirconium oxide in the NO<sub>x</sub> reduction composition. However, Peters uses ceria (See column 2, lines 50-52) and further discloses, "Other non-stoichiometric metal oxides having known oxygen storage capability may also be used (Column 2, lines 52-53).

Aubert invention discloses a composition based on zirconium and cerium oxides and its use in NO<sub>x</sub> reduction. Aubert further discloses that the composition comprises of (i) zirconium oxide and cerium oxide and it is provided in the form of pure solid solution of cerium oxide in zirconium oxide. (See column 1, lines 30-35). The invention further adds that the composition additionally contains (ii) a doping element chosen alone or a mixture from rare earth metals, alkaline earth metals, particularly lanthanum (See column 2, lines 47-57).

Aubert also discloses that the composition of the invention can be used in the catalysis of various reactions such as hydrodenitrification, cracking, hydrocracking etc. (See column 7, lines 50-60). Aubert discloses that zirconium oxide and cerium oxide today appear as two particularly important and advantageous constituents in multifunctional catalysts (See column 1, lines 10-17).

Since Peters and Aubert both inventions are disclosing a similar NO<sub>x</sub> reduction composition in a catalytic cracking process, and also since zirconium is known for its oxygen storage capability, it would have been obvious to one skilled in the art at the time the invention was made to modify Peters invention and add (i) a mixed zirconium

oxide and cerium oxide as suggested by Aubert into the composition of Peters for an enhanced NO<sub>x</sub> reduction capability. *See In Re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980). It would also have been obvious to combine Peters and Aubert inventions and specify the ratio of cerium plus zirconium oxide and other components of the NO<sub>x</sub> reduction composition given by Peters.

7. With respect to claims 18 and 19, Peters invention discloses, "The invention encompasses FCC processes using the NO<sub>x</sub> reduction compositions of the invention either as an integral part of the FCC catalyst particles themselves or as separate admixture particles in the FCC catalyst inventory." (Column 1, lines 63-67).

8. With respect to claim 20, Peters invention discloses, "The said cracking catalyst is fluidized during contacting said hydrocarbon feedstock." (Claim 13, column 6, lines 41-42).

9. With respect to claim 21, Peters invention discloses, "The method of claim 12 further comprising recovering used cracking catalyst from said contacting step and treating said used catalyst under conditions to regenerate said catalyst." (Claim 14, column 6, lines 43-46).

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10. With respect to claim 22, Peters invention discloses, "The method of claim 12, wherein said hydrocarbon feedstock contains at least 0.1 wt% nitrogen." (Claim 15, column 6, lines 47-48).

11. With respect to claim 23, Peters invention does not disclose cerium and zirconium oxide contents.

Aubert discloses, "Expressed in the form of oxides, the compositions according to the invention generally exhibit a Zr/Ce atomic ratio equal to or greater than 1." (Column 3, lines 10-15). "According to other embodiment of the invention, the cerium proportion can be at most 20%." (Column 3, lines 26-28). Thus, as discussed under claim 17, it would have been obvious to one skilled in the art at the time the invention was made to modify Peters invention and use a Zr/Ce ratio as claimed, for a better NO<sub>x</sub> reduction composition.

12. With respect to claim 25, Peters invention discloses, "Preferably, the transition metal is selected from the group consisting of Cu, Ag and mixtures thereof." (Column 2, lines 66-67).

13. With respect to claims 26 and 27, Peters invention discloses, "The transition metal oxide having oxygen storage capability may be any transition metal oxide having oxygen storage capability similar to that of ceria." (Column 2, lines 47-49).

Since Peters suggests using any transition metal oxide similar to ceria and Aubert discloses using lanthanum as a doping element in the NO<sub>x</sub> reduction

composition as discussed under claim 17, it would have been obvious to one skilled in the art at the time the invention was made to modify Peters invention and use lanthanum oxide in place of ceria for similar performance in the NO<sub>x</sub> reduction. Aubert further discloses, "Mention may more particularly be made of yttrium, lanthanum, neodymium, praseodymium, europium, and samarium." (Column 2, lines 55-57). See *In Re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958).

14. With respect to claims 28 and 29, Peters invention discloses, "The amount of NO<sub>x</sub> reduction component in the additive particles is preferably at least 50 wt%." (Column 3, lines 21-23).

### ***Double Patenting***

15. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thornton*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.



Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

16. Claims 17-23 and 25-29 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,852,298. Although the conflicting claims are not identical, they are not patentably distinct from each other because the '298 claims have an acidic oxide support and only cerium oxide as one component. The present application does not claim an acidic support and claims a mixed oxide of cerium and zirconium. Since the support material does not play an active role in the NO<sub>x</sub> reduction process during FCC operation, and since zirconium and cerium appear to be two particularly important and advantageous constituents in multifunctional catalysts for NO<sub>x</sub> reduction, it would have been obvious to one skilled in the art at the time the invention was made to modify the '298 claims to eliminate the acidic oxide support and include zirconium with cerium for an enhanced NO<sub>x</sub> reduction.

### ***Response to Arguments***

17. Applicant's arguments filed 01/31/2008 have been fully considered but they are not persuasive.

18. The Applicant argues that essentially the Examiner is stating that ceria and a mixed oxide of cerium and zirconium, are equivalent and/or the broad suggestion

that the solid solution of cerium oxide and zirconium oxide in Aubert would have known advantages in removing NO<sub>x</sub> in an FCC process. Applicants strongly disagree. There is no suggestion in any of the applied references that ceria and a mixed oxide of cerium and zirconium are equivalent. Just as importantly, Aubert does not disclose the advantages that Applicants have found using a mixed oxide of cerium and zirconium in an FCC process for NO<sub>x</sub> reduction.

The Applicant's argument is not persuasive because the examiner does not state that ceria and a mixed oxide of cerium and zirconium are equivalent. Peters clearly discloses, "The transition metal oxide having oxygen storage capability may be any transitional metal oxide having oxygen storage capability similar to that of ceria. Preferably, at least a portion of the oxygen storage oxide is ceria. Other non-stoichiometric metal oxides having known oxygen storage capability may also be used (See column 2, lines 47-53). Aubert discloses, "Multifunctional catalysts is understood to means catalysts capable of carrying out not only oxidation, in particular of carbon monoxide and hydrocarbons present in the exhaust gases, but also reduction, in particularly of nitrogen oxides also present in these gases ("three way" catalysts). Zirconium oxide and cerium oxide today appear as two particularly important and advantageous constituents in this type of catalyst" (Column 1, lines 10-18). Obviously, cerium oxide and zirconium oxide are important constituents of a NO<sub>x</sub> removal composition. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Peters invention and use a mixture of cerium oxide and zirconium oxide for enhanced NO<sub>x</sub> removal.

19. The Applicant argues that it is Applicants' position that while mixed oxides of cerium and zirconium with other optional oxides or rare earths have found extensive use in automotive exhaust catalysts, the stability which Applicants have found in FCC processing has not been known prior to this invention, and is certainly not suggested in the broad recitation of possible catalysis provided by a mixed oxide of cerium and zirconium in Aubert. In particular, Aubert does not remotely suggest the results which are shown in Table 1 of the present application in which the mixed oxide of cerium and zirconium alone, or with other of the claimed components, has an improved NO uptake as well as improved surface area retention and NO retention after steaming, which represents an aged catalyst during FCC. None of this data is remotely suggested in the broad disclosure of Aubert.

The Applicant's argument is not persuasive because Peters discloses use of cerium oxide in FCC process and Aubert discloses use of cerium oxide and zirconium oxide in a "three way" catalyst for NO<sub>x</sub> removal as discussed above. Thus, the combined teachings of Peters and Aubert will inherently have all the claimed advantages including results shown in Table 1.

20. The Applicant argues that the fact that the catalyst of Aubert can be washed and then heated to remove water is not at all the same as the steaming conditions which represents the aging of a catalyst in FCC processing as is notorious in the FCC art.

The Applicant's argument is not persuasive because Aubert discloses typical steps involved in making the catalyst composition including, thermohydrolysis, washing, drying and calcining (See column 3, lines 48-67; column 4, lines 1-67; column 5, lines 1-67; column 6, lines 1-36). Aubert also discloses that the catalyst system is useful for cracking (See column 7, lines 50-63).

21. The Applicant argues that Aubert is not at all specifically concerned with NO<sub>x</sub> reduction. The patent states in a paragraph at column 7, lines 50-63 that the catalytic system has a great many applications and essentially lists every catalytic process imaginable. There is no specific reference to NO<sub>x</sub> reduction and certainly no specific reference to NO<sub>x</sub> reduction in an FCC process wherein the mixed oxide of cerium and zirconium has improved stability over ceria or zirconia alone as shown in the present application.

The Applicant's argument is not persuasive because Aubert discloses that zirconium oxide and cerium oxide are two particularly important constituents of a multifunctional catalyst for NO<sub>x</sub> reduction (See column 1, lines 9-18). Peters discloses use of cerium oxide in FCC and suggests use of another transition element with oxygen storage capability. Zirconium oxide is the transition metal oxide with oxygen storage capability. Thus, the combined teachings of Peters and Aubert fully disclose the claimed invention.

22. The Applicant argues about non-statutory ODP of claims 17-23 and 25-29 over claims 1-9 of US 6,852,298 stating that in the '298 patent, a mixture of cerium oxide and an oxide of a lanthanide series element other than ceria is claimed and the ratio of the cerium oxides to the other lanthanide oxide is specifically set forth. The presently claimed invention is not directed to ceria but is directed to a solid solution of a mixed oxide of cerium and zirconium. Accordingly, it would not have been obvious to substitute a mixed oxide of cerium and zirconium for ceria alone of the patent.

The Applicant's argument is not persuasive because although patent '298 claims cerium oxide, the patent also discloses that the prior art teaches use of transition metal oxide having oxygen storage capability for NO<sub>x</sub> reduction (See column 2, lines 60, 66-67). Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify patent '298 claims to include any transition metal oxide with oxygen storage capability, including zirconium oxide. Patent '298 also discloses that the ratio of cerium oxide to the oxide of a lanthanide series element other than ceria could be as high as 500:1 (See column 4, lines 39-41). Ceria in the composition is from 1-25 parts per 100 parts of support (See column 4, line 18-25). Obviously, the lanthanide element other than ceria could be negligible as compared to ceria in the final catalyst composition. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify patent '298 claims not to include the other lanthanide series element because of its insignificant amount in the final catalyst composition.

***Conclusion***

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 8:00 AM-4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Glenn A Caldarola/  
Acting SPE of Art Unit 1797

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